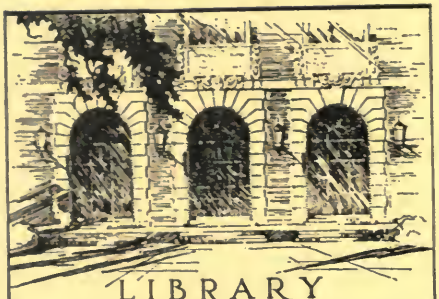

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Behavior of the Lizard Corythophanes cristatus

Chicago Natural History Museum recently received, by air express, three living individuals of the iguanid lizard *Corythophanes cristatus* from Gallon Jug, British Honduras. These specimens were acquired through the courtesy of Mr. A. Wolffsohn of Gallon Jug, Forest Officer to the Belize Estate and Produce Company. The behavior of these animals is so remarkable that it was recorded in written notes, in a series of still photographs, and on 16 mm. motion picture film.

Corythophanes is a genus of tropical American lizards containing three species. They appear to be most closely related to the terrestrial *Laemanctus* and the terrestrial and arboreal *Basiliscus*. Little is known of the ecological relationships of the members of this genus, and nothing is known of their habits. All species of *Corythophanes* appear to be arboreal. Stuart (1948) wrote that at Alta Verapaz, Guatemala, *C. cristatus* "is apparently restricted to the humid lowlands." Sanderson (1941) states that in British Honduras a specimen of *C. cristatus* was "caught on the ground or only a few inches off it, in a large clump of 'dumb-cane' (*Tripsacum dactyloides*), which covered the floor of a forest composed wholly of small pine trees . . . enveloped on three sides by tall, virgin rain forest." Mr. Wolffsohn writes (*in litt.*) that in the Gallon Jug area of British Honduras *C. cristatus* is found, together with *C. hernandesi*, in high original forest, in secondary high forest, and in low (*bajo*) forest. *C. cristatus*, he states, "occurs clinging vertically to small tree trunks."

Arboreal adaptations in this lizard are obvious. The body is vertically compressed. The legs are long and slender, and the toes curved and very sharp-clawed. The tips of the scales on the belly and under side of the tail are acuminate and elevated, so that they catch hold of any irregularity in the substrate; their combined holding power is considerable. In captivity the animals remained continuously among branches provided in the cage. Vision appears to be acute; meal worms lying in a small metal tray were spotted at a distance of 12–18 inches.

POSTURE AND LOCOMOTION

Corythophanes normally orients itself along a branch or twig, the belly resting against the branch, the hind feet slightly behind the base of the tail, the tail hanging straight down either along the branch or in the air (pl. 1, fig. 1). This posture does not differ significantly from that of other arboreal iguanids (*Iguana*, *Anolis*). On the ground, in the alert posture, the head and forequarters are elevated, the hind quarters depressed, with the hind legs loosely folded like a letter Z (pl. 2, fig. 5). This again is similar to the posture of other long-legged iguanids.

These animals were so sluggish that it was difficult to make observations on locomotion. On the ground they move in sudden short rushes, using alternating movements of the legs. At high speed they are bipedal. Among the branches of a tree they leap from branch to branch, the line of movement at right angles to the axis of the branch. The hind legs are drawn up and then suddenly extended, propelling the animal across to an adjoining branch or twig, which is seized with the extended forefeet. This cycle may be repeated several times in a single burst of activity, carrying the animal across a succession of branches. The distance spanned in each leap is not great; in no observed instance did it much exceed the length of the animal's body.

This leaping locomotion is very similar to that described and figured by Böker (1935, p. 63) for *Polychrus*, another tropical iguanid. Böker called this "bipedal leaping" (*bipeden Sprung*). It is obviously very similar mechanically to the leaping of frogs and *Tarsius*, and is an effective method of locomotion for light-bodied animals among the twigs and branches of dense forest.

PASSIVE CONCEALMENT

The sluggishness of these lizards was astonishing, the more so in contrast with their quick movements during short bursts of activity. All three were placed on a freshly cut leafy branch, about four feet long, of a cottonwood tree (*Populus* sp.), and the branch was propped upright in the center of a room measuring 10 by 14 feet. The animals were observed at irregular intervals over a 48-hour period, during which they did not leave the branch and no voluntary change of position was noted. No inter-individual aggression was observed at any time. It was extraordinarily difficult to see the lizards among the cottonwood leaves; even with three individuals on this

small branch, casual observers repeatedly failed to note their presence or had difficulty finding them after being informed of their presence. Color, irregular outline, and especially immobility contribute to this effective camouflage. A pair of widely spaced longitudinal ridges running the length of the body on each side helps disguise the body outline.

When an animal's position was forcibly changed, or when it came to rest after voluntary movement, it "froze" in whatever posture it happened to be in. The resulting positions were often extremely awkward-looking (pl. 1, figs. 2–4). Often one or more legs stuck stiffly into the air, or the tail projected like a stiff wire. The legs and tail, when manipulated, remained in the positions in which they were placed except when such positions put an obvious strain on muscles and ligaments. Animals handled experimentally hung suspended from a single claw, or could be balanced crosswise on a branch with none of the feet in contact. Any of these postures, once assumed, was maintained for minutes on end without any perceptible movement except that the eyes remained open and followed a moving object. The effect suggested a formalin-hardened specimen placed carelessly on a branch.

This behavior is very similar to the well-known catalepsy of the walking-stick insects (Phasmidae), and it obviously serves the same purpose; that is, it makes the animal inconspicuous among the branches and foliage of an arboreal environment by eliminating all minor movement not directly associated with change of position. Hediger (1935) observed similar behavior in arboreal agamids (*Agama bibroni, Gonocephalus godeffroyi*), and Böker (1932) described it for another arboreal iguanid (*Uraniscodon superciliosum*). Hediger, in describing this phenomenon, unfortunately did not distinguish between catalepsy, true sleep, and the well-known "hypnotism" seen in lizards, amphibians, and birds when they are placed on their backs.

RESPONSE TO HOSTILE SITUATION

Threatening movements by the observer usually produced a very definite postural response in the animal. This response was most readily elicited by bringing a snake close to the lizard. Recognition appeared to be delayed and to depend on movement of the snake, but the postural reaction followed recognition almost immediately. A specimen of the tree-snake *Thalerophis occidentalis*, received in the

same shipment with the lizards, was used in the experiments, but local snakes produced the same response.

When the snake was perceived, usually at a distance of four to six inches, the lizard stiffened, opened its eyes widely, and oriented itself so that the side of the head faced the snake. The head was then depressed at its junction with the neck, in extreme cases at an angle of nearly 90° to the axis of the body. Because of the long post-occipital process on the rear of the skull, this movement expanded and elevated the nuchal crest. At the same time the throat fan was expanded to a maximum. Thus the whole head was converted into a thin disk roughly four times the normal vertical diameter of the head. At the same time the body was compressed, and the lizard elevated itself on its legs in a stiff-legged posture (pl. 2, figs. 6, 7; pl. 3, figs. 8, 9). The animal continually maneuvered itself so that the side of the head was presented to the snake (pl. 3, figs. 8, 9). On several occasions the display terminated in a slow bobbing of the head; this involved only the head, and not the fore part of the body. All movements during this display behavior had a peculiar jerky, mechanical quality.

When further molested during the display behavior, the lizard sometimes lunged forward with open mouth. The lunge is a quick rocking forward on the legs, which produces a forward thrust of about four inches; the animal does not leave the ground. The object may merely be struck with the open mouth, or the jaws may be closed on contact. This behavior could be elicited by moving the observer's hand toward the aroused lizard. It was not observed in any of the experiments in which snakes were used as a stimulus.

Finally, when handled roughly, the animals often bit savagely.

DISCUSSION

Both the cataleptic posture and the partial expansion of the nuchal crest and throat fan in *Corythophanes cristatus* are well shown by Cott (1940, pl. 1). These postures are meaningless, of course, unless related to the appropriate behavior, and Cott does not mention them in the accompanying text.

An interesting sequence of defensive mechanisms, successively more narrowly focused, is evident in the behavior of *Corythophanes*. The nature of the response is geared to the immediacy of the threat to the animal's safety. Such formalized sequences of defensive maneuvers are known for many vertebrates, although few have been

studied. Probably best known to Americans is the spectacular behavior pattern of the hog-nosed snakes (*Heterodon*). The sequence in *Corythophanes* is as follows:

(1) Generalized passive defense through continuous *camouflage*. This involves (a) color and pattern, (b) devices for concealing the body outline, and (c) immobility.

(2) *Catalepsy* as an active but non-aggressive response to a specific localized stimulus.

(3) Active *postural maneuvers* to increase the apparent size of the animal in the eyes of the agent that is actively threatening it. This involves (a) presenting the expanded area broadside to the aggressor, and (b) moving it conspicuously before him.

(4) *Aggressive biting* when all other devices have failed.

Increasing the apparent size of the body or parts of the body is well known for many animals. Mertens (1952) recently published a series of excellent photographs and a description of such behavior in the Old World terrestrial agamid lizard *Phrynocephalus mystaceus*. In this lizard, erection of a skin flap at each corner of the mouth doubles the apparent diameter of the mouth, and the body is depressed dorso-ventrally. The animal orients itself so that it faces its enemy, thus displaying the expanded area to maximum advantage. The plane of expansion is frontal in *Phrynocephalus* and sagittal in *Corythophanes*, and it is noteworthy that in each case the orientation of the body is correlated with the plane of expansion.

The postural maneuvers of *Corythophanes* (compressing the body, erecting the nuchal crest, expanding the throat fan, head bobbing) are similar to those used in social fighting by many iguanids (Noble and Bradley, 1933). C. M. Bogert writes (*in litt.*) that in a large cage in the American Museum "many iguanids, including *Dipsosaurus*, *Phrynosoma*, and *Sceloporus*, react to the presence of a snake by orienting the body to expose the broad side." None of the three lizards he mentions is vertically compressed, and *Phrynosoma* is in fact among the most depressed of lizards. This suggests (1) that a basic behavioral pattern used in social fighting exists in the Iguanidae. This pattern is the same in compressed forms (*Anolis*) as in strongly depressed forms (*Phrynosoma*), which shows that it is not conditioned by body form. (2) The same behavioral pattern used in social fighting is used in other hostile situations, such as the presence of a potential predator.

It is interesting that in *Corythophanes* the stereotyped iguanid posture would make it difficult or impossible for a slender snake to swallow the animal. This is undoubtedly an incidental advantage of no importance in the origin and evolution of the postural response.

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EXPLANATION OF PLATE 1

Fig. 1. Normal posture of *Corythophanes cristatus* on branch.

Fig. 2. Cataleptic posture of the same animal.

Fig. 3. Animal in cataleptic posture, suspended from one forefoot.

Fig. 4. Dorsal view of animal in cataleptic posture.

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EXPLANATION OF PLATE 2

Fig. 5. Normal posture on flat surface.

Fig. 6. Posture when confronted with a snake: nuchal crest and throat fan expanded, body compressed and elevated on stiff legs.

Fig. 7. Another view of displaying lizard. The snake is a tree snake, *Thalerophis occidentalis*.

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EXPLANATION OF PLATE 3

Fig. 8. Presenting expanded head to snake.

Fig. 9. Anterior view, showing orientation of expanded head toward snake.

Fig. 10. Anterior view of displaying animal, showing vertical compression of head and body and widely spread hind legs.

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